CHAPTER 5
HAZARDOUS MATERIALS

C5.1 SCOPE

This Chapter contains criteria for the storage, handling, and disposition of hazardous materials. It does not cover solid or hazardous waste, underground storage tanks, petroleum storage, or related spill contingency and emergency response requirements. These matters are covered under other Chapters. These final governing standards (FGS) do not cover munitions.

C5.2 DEFINITIONS

Above-Ground Storage Tank *(Oberirdische Tankanlage oder Anlagenteile davon)*. A tank that is not underground. A tank in an underground space that can easily be inspected or is easily accessible, to include piping in an underground protecting tube, a tunnel, or a crawlspace that can easily be inspected or is easily accessible, is considered an above-ground storage tank. A tank that sits directly on the ground is also considered an above-ground storage tank.

ADR. Officially known as "The European Agreement concerning the International Carriage of Dangerous Goods by Road", it provides the basis for transportation of hazardous materials criteria.

Carcinogen. Substances and preparations which may cause cancer or elevate the risk of cancer through inhalation, ingestion, or skin penetration.

Consignor. Sender of a consignment of hazardous goods.

Consignee. Receiver of a consignment of hazardous goods.

Container *(Behälter)*. A general term used to describe different types of receptacles to include tanks, drums, cans, and canisters.

Dangerous Goods *(Gefahrgut)*. An ADR classification for the shipment of hazardous substances.

Determination of Suitability *(Eignungsfeststellung)*. The determination of suitability is an acceptance check by the respective State environmental agency *(Landesumweltamt)* on facilities or equipment that is carried out prior to the start-up of an operation. The determination of suitability may be conducted for a facility as a whole and/or for individual facility components. As an example, a filling station may include several underground storage tanks (USTs) and fuel dispensing equipment. In this instance, the USTs and the dispensing equipment can be issued a determination of suitability individually, or the facility can be issued a determination as a whole.

Drum Storage *(Faß- und Gebindelager)*. An area used for the storage of drums or other containers.

European Inventory of Existing Commercial Substances (EINECS). A European list of commercially available materials (both hazardous and non-hazardous). This list includes all materials that are assumed to be available on the European market since 18 September 1981.

The current EINECS list may be obtained from the Federal Agency for Occupational Health and Safety *(Bundesanstalt für Arbeitsschutz und Arbeitssicherheit)*, Dortmund, Germany or the European Chemical Bureau (http://ecb.jrc.it).

Expert *(Sachverständiger)*. An individual who is knowledgeable of the daily operations, applicable health and safety regulations, and the technical standards of a facility, which he/she supervises or is asked to inspect. An expert is an individual external to DoD. Depending on specific requirements, an expert may require specific training or may need to be registered as such by a competent German authority.

Filling Facility *(Abfüllanlagen)*. Devices used for filling containers with POL substances; these also include areas in which POL substances are filled from one container into another. There is no volume limit value that defines a filling facility.

Filling Safeguards *(Abfüllsicherungen)*. Devices that discontinue a filling procedure by activating a shut-off device in the container (this may also apply to a tanker truck) from which the hazardous substance is filled into the container.

Hazard Class *(Gefahrklasse)*. A classification of hazard based on the flammability of substances as outlined below.

Hazard Classes*(Gefahrklasse)*

Hazard Class	Flash Point
A I	< 21° C
A II	21-55° C
A III	55-100° C
B	< 21° C and water-soluble at 15° C

Hazard Sign *(Warnzeichen)*. A sign posted at workplaces where hazardous materials are stored or handled that warns against a specific risk or danger (i.e., risks or dangers associated with flammables, toxics, irritants, oxidizers, compressed gases, batteries, or explosive atmosphere). Reference C5.3.7.3 and Appendix C5.A4.

Hazardous Materials. Raw materials, commodities, or other manufactured products that exhibit at least one of the hazardous characteristics described in Table C5.T3. Hazardous materials do not include hazardous wastes.

Hazardous Material Information System (HMIS). The computer-based information system developed to accumulate, maintain, and disseminate important information on hazardous material used by DoD. The HMIS has been assigned Report Control Symbol DD-A&T(AR)1486 in accordance with DoD 8910-M.

Hazardous Material Shipment. Any movement of hazardous material in a vehicle either from an installation to a final destination off the installation, or from a point of origin off the installation to a final destination on the installation.

Hazardous Substances. Substances that are classified as hazardous according to a range of properties (i.e., flammable, oxidizing, or representing a hazard to the environment) described in Table C5.T3. Hazardous substances include both hazardous materials and hazardous wastes.

Installation. A base, camp, post, station, yard, center, or other activity under the jurisdiction of the Secretary of a Military Department that is located outside the United States and outside any territory, Commonwealth, or possession of the United States.

Leak Detection Device *(Leckanzeigegerät).* Devices that automatically detect a leak in walls and/or floors of containers or piping. Leak detection devices are comprised of the leak detector equipment, the medium used for detecting the leak, as applicable, and the monitoring space *(Überwachungsraum).*

Leak Detection Sensor *(Leckagesonde).* Devices that automatically detect the leak of liquid water endangering substances or the infiltration of water into a controlled area or fluid retention room. Leak detection sensors consist of point sensors (leak sensors), line sensors (cables, hoses) and surface sensors (mats), and the associated detection equipment.

Leak Protection Liner *(Leckschutzauskleidung).* Flexible or rigid intermediate layers that conform to the shape of a container and are designed to create an operational monitoring space *(Überwachungsraum)* within a single-walled container for the purpose of carrying out leak control.

Mandatory Sign *(Gebotszeichen).* A sign placed at a workplace where hazardous materials are stored or handled that indicates that a certain behavior must be followed, for example the use of specific personal protection equipment (i.e., safety masks, goggles, or gloves) or special precautionary measures. Reference C5.3.7.3 and Appendix C5.A5.

Material Safety Data Sheet (MSDS) *(Sicherheitsdatenblatt).* A form used by manufacturers or distributors of chemical products to communicate to the user the chemical, physical, and hazardous properties of the product, as well as advice for safe handling, and regulatory information (see C5.3.5).

Materials *(Stoffe).* Chemical elements and their compounds in the natural state or derived from a production process, including any additives necessary to preserve stability and any impurity derived from the process used, but excluding any solvent, that may be separated from the substance without affecting its stability or composition.

Mutagen. Substances and preparations which may cause hereditary defects or may elevate the risk of hereditary defects through inhalation, ingestion, or skin penetration.

Operating Instructions *(Betriebsanweisungen).* Workplace-specific instructions that provide information on handling hazardous substances as well as information on risks for human health

and the environment associated with hazardous substances handled at each specific workplace. An example of an operating instruction is provided in Appendix C5.A6.

Ordinary and Conventional Facilities *(einfache und herkömmliche Anlagen)*. Facilities storing, distributing, and/or handling water endangering substances that are designed and constructed so that the risk of water pollution is low. See C5.3.14.4 and Appendix C5.A7 for detailed criteria.

Overfill Prevention Devices *(Überfüllsicherungen)*. Devices that automatically discontinue the filling procedure or set off an alarm before hazardous substances have reached the maximum admissible level in the container being filled.

Piping *(Rohrleitungen)*. Rigid or flexible piping used to convey substances. Piping also comprises fittings, flanges, and gaskets. There are several categories of piping: piping within the premises of an installation (i.e., on-site piping) and piping extending outside the premises of an installation (i.e., off-site piping). On-site piping is always part of a facility (e.g., a filling station, a fuel unloading facility, or a stationary airfield tank facility *(Flugbetankungsanlage*)). Piping that extends beyond the site area and connects facilities that are closely related, both physically and operatively, is called connecting piping *(Verbindungsleitung)*.

Preparations *(Zubereitungen)*. Mixtures, blends, or solutions composed of two or more substances.

Qualified Individual *(Sachkundiger)*. An individual who is knowledgeable of the daily operations, applicable health and safety regulations, and the technical standards of a facility, which he/she supervises or is asked to inspect. A qualified individual may be internal to DoD. Depending on specific requirements, an expert may require specific training; however, a qualified individual need not be registered as such by a competent German authority.

Risk Phrase (R-Satz). The Risk Phrase (R-phrase) *(Angabe besonderer Risiken)* is part of a hazardous material label. The R-phrase indicates the special risks associated with the particular material. A description of individual R-phrases is in Table C5.T6.

Safety Advice Phrase (S-Satz). The Safety Advice Phrase (S-phrase) *(Sicherheitsratschlag)* is part of a hazardous material label. The S-phrase indicates the special safety precautions one must take when handling a specific material. A description of individual S phrases is in Table C5.T6.

Safety Sign *(Sicherheitszeichen)*. A sign that addresses information regarding health and safety concerns. A safety sign consists of a combination of a geometric shapes and colors with a hazard symbol. A safety sign may be a hazard sign *(Warnzeichen)* or a mandatory sign *(Gebotszeichen)*. Reference C5.3.7.3 and Appendices C5.A4 and C5.A5.

Secondary Containment *(Auffangvorrichtung)*. Leak-proof constructions, rooms in buildings (fluid retention rooms), and/or pre-fabricated building components (collecting *vats/Auffangwannen)* that are designed to collect leaking substances from containers or piping, and leak-proof drainage areas designed to channel off leaking substances from containers or pipelines into collection devices (e.g., holding tanks, sumps).

Special Protection Area. A special protection area is defined as the space surrounding compressed gas cylinders storing flammable or very toxic gases, where the release of gas or gas/air mixtures cannot be excluded following leakage at connections or fittings, or during the change of connections. The special protection area is based on the type of gas (see Appendix C5.A10).

State of the art of technology *(Stand der Technik)*. The current state of the art of technology is the developmental stage of advanced processes, installations, or modes of operation that makes the practical suitability of a measure for the protection of the environment or human health appear assured. When determining the state of the art of technology, particular consideration is to be given to comparable processes, installations, or mode of operations that have been tested successfully in practice.

Storage, Distribution, and Handling Facility *(Anlage zum Lagern, Abfüllen, Umschlagen, Herstellen, Behandeln und Verwenden*). Independent, stationary, or quasi-stationary units that handle water endangering substances and are used for more than a short period of time. There is not an established minimum period of time a facility is to be used at one location to be considered stationary. The temporary storage of water endangering substances in areas not normally designated for this purpose (i.e., temporary storage for transportation) is not considered a storage, distribution, and handling facility (the temporary storage for transportation must not exceed 24 hours, unless non-labor days are between the temporary storage and off-site shipment). The definition of a storage, distribution, and handling facility does not address a minimum volume. A facility that is used primarily for the distribution of water endangering substances includes filling and trans-shipment activities. A facility that is used for the handling of water endangering substances includes the production, processing, and use of these substances. A facility storing and filling flammable liquids must fulfill additional requirements *(Anlage zur Lagerung brennbarer Flüssigkeiten)* that are dependent upon the volume and Hazard Class of the substances handled.

Trans-shipment Facilities *(Umschlagsanlagen)*. Areas and equipment used for the loading and unloading of water endangering substances from one transport vehicle to another (e.g., from a rail tank car to a tank truck), either as bulk loads or as packaged products.

Underground Storage Tank (UST) *(Unterirdische Tankanlage)*. A facility that is wholly- or partially-embedded in the ground, without restriction with respect to volume. This does not include gutters and sewers that cannot easily be inspected. A storage tank sitting on the ground is not considered an underground storage tank.

Water Endangering Substances. Water endangering substances are all substances classified under Water Hazard Class 1 to 3 (see Definition Water Hazard Class).

Water Hazard Category *(Gefährdungsstufe)*. Classification of facilities based on the volume and Water Hazard Class (WGK) of the substances used at the facilities. Reference Table C5.T2.

Water Hazard Class *(Wassergefährdungsklasse)*. Classification of substances based on their potential for endangering water resources as outlined below:

Water Hazard Classes *(Wassergefährdungsklasse, WGK)*
(See also Table C5.T1)

WGK 1	Substance with a low hazard rating for water
WGK 2	Substance with a medium hazard rating for water
WGK 3	Substance with a high hazard rating for water

C5.3 GENERAL REQUIREMENTS

C5.3.1 Storage and Handling of Hazardous Materials

Storage and handling of hazardous materials shall adhere to these FGS and DoD Component policies, including Joint Service Publication on Storage and Handling of Hazardous Materials. DLAI 4145.11, TM 38-410, NAVSUP PUB 573, AFJMAN 23-209, and MCO 4450.12A. The International Maritime Dangerous Goods (IMDG) Code and appropriate DoD and component instructions provide requirements for international maritime transport of hazardous materials originating from DoD installations. International air shipments of hazardous materials originating from DoD installations are subject to International Civil Air Organization Rules or DoD Component guidance including AFJM 24-204, TM 38-250, NAVSUP 505, MCO P4030.19E, and DLAM 4145.3.

C5.3.2 Hazardous Material Dispensing Areas

Hazardous material dispensing areas will be properly maintained (see criteria C5.3.14 and C5.3.16). Only compatible hazardous materials may be stored together. Drums/containers must not be leaking. Drip pans/absorbent materials will be placed under containers as necessary to collect drips or spills. Container contents will be clearly marked according to the labeling requirements outlined in C5.3.7. Dispensing areas will be located away from catch basins and storm drains.

C5.3.2.1 In addition to general aisle space requirements outlined in the Joint Service Manual for Storage and Materials Handling (TM 38-400/NAVSUP PUB 572/AFJMAN 23-21/MCO 4450.14/DLAM 4145.12), aisle width shall be at least 3.0 meters (10 feet) when operating material handling equipment within storage areas, or the width of the widest material handling equipment used within a storage area plus 1.0 meter (3 feet), whichever is greater.

C5.3.2.2 Aisles within work or storage areas with an area greater than 1,000 m² (1,196 yd^2) must be marked unless the aisle space is otherwise easily recognizable.

C5.3.3 Hazardous Material Shipment

Consignors will ensure the following for each hazardous material shipment.

C5.3.3.1 The following documents must accompany the shipment:

- the driver's ADR training certificate *(ADR-Bescheinigung des Fahrers);*

- the container packing certificate *(Containerpackzertifikat)* as prescribed by the ADR, as appropriate;
- the ADR certificate of approval for each transport unit or element thereof;
- the ADR permit authorizing the transport operation *(Bescheinigung des Absenders über die Zulässigkeit des Transports);*
- determination of the driving route *(Fahrwegbestimmung);*
- confirmation that it is unreasonable to transport dangerous goods on the highway *(Unzumutbarkeitsbescheinigung),* as appropriate; and
- written instructions for the driver (see Appendix C5.A9) or accident notes *(Schriftliche Weisungen or Unfallmerkblätter)* according to the ADR.

C5.3.3.2 All drivers must receive training in accordance with the ADR and be provided with written instructions *(schriftliche Weisung or Unfallmerkblätter,* see C5.3.3.1 and Appendix C5.A9).

C5.3.3.2.1 Written instructions are to be provided by the consignor *(Absender),* forwarded to the carrier *(Beförderer),* who, in turn, must make the written instructions available to the driver. Written instructions must include the following information:

- the name and identification of the substance, article or group of goods;
- dangers inherent in the goods to be shipped;
- general emergency actions (e.g., the warning of other drivers on the road, contacting the police);
- handling of minor leaks or spills (without personal risk);
- emergency procedures for special products; and
- necessary equipment for emergency response activities.

C5.3.3.3 Transportation documents, and vehicles shall be inspected by the driver and a responsible individual (see C5.3.22.3) designated by the consignor before and after the material is loaded and by the driver and a responsible individual designated by the consignee prior to the unloading of dangerous goods. Additionally, vehicle driver documents (e.g., appropriate training documentation, license, see C5.3.3.1) must be examined by the consignor's designated responsible individual at the loading sites and by the consignee's designated responsible individual at the unloading sites. It is prohibited to load the vehicle, if the examination of the transportation documents or the visual inspection of the vehicle and equipment show that the vehicle or the driver does not comply with the requirements of C5.3.3.1. It is also prohibited to unload the vehicle if the examination of the transportation documents or the visual inspection of the vehicle and equipment indicate that existing deficiencies do not allow for the safe unloading of the vehicle.

C5.3.3.4 Packages are labeled in accordance with C5.3.7.

C5.3.4 Master Listing and Inventory

Each installation will maintain a master listing of all storage, distribution and handling locations *(Anlagen zum Lagern, Abfüllen und Umschlagen)* for hazardous materials and an inventory of all hazardous materials contained therein. This master listing and the inventory are also required as part of the installation's comprehensive Spill Prevention and Response Plan (see Chapter 18, Spill Prevention and Response Planning). The inventory must be updated annually or after any significant changes with regard to type and quantity of hazardous materials stored and/or used.

C5.3.5 MSDS

The installation must maintain a MSDS for all hazardous materials procured, used, or stored. Each MSDS shall be in English or the predominant language of the workforce, and should contain, at a minimum, the information contained in Appendix C5.A3.

C5.3.6 Filing of MSDSs

C5.3.6.1 At locations where German employees are required to work with hazardous substances, each work center will maintain a file of operating instructions *(Betriebsanweisung)* for each hazardous material procured, stored, or used at the work center. The operating instructions shall be provided in German (an example is provided in Appendix C5.A9.).

C5.3.6.2 At locations where U.S. military or U.S. civilians are required to work with hazardous substances, each work center will maintain a file of MSDSs for each hazardous material procured, stored, or used at the work center. MSDSs, which are not contained in the Hazardous Material Information System (HMIS) and those prepared for locally purchased items, should be incorporated into HMIS. A file of MSDS information not contained in HMIS should be maintained on site.

C5.3.7 Hazardous Chemical Warning Label

All hazardous materials on DoD installations of U.S. origin will have a Hazardous Chemical Warning Label in accordance with DoD 6050.5-H. These requirements apply throughout the life cycle of these materials. The requirements of C5.3.7.1 and C5.3.7.2 apply to hazardous materials on DoD installations that are not of U.S. origin.

C5.3.7.1 Labeling Requirements for Individual Containers of Hazardous Materials

C5.3.7.1.1 All containers of hazardous materials and preparations, including compressed gas cylinders, must be labeled in German and English with the following:

- the internationally recognized name of the substance;
- EEC number according to EINECS, as applicable;
- the name, complete address and telephone number of the manufacturer, importer or distributor/seller in charge; and

- the hazard symbol *(Gefahrensymbole)* and hazard definition *(Gefahrenbezeichnungen)* as contained in Appendix C5.A4.

C5.3.7.1.2 R and S Phrases are required for specific hazardous materials to be indicated on the label, except for materials listed in C5.3.7.1.3. Table C5.T6 identifies specific R and S Phrase labeling requirements for hazardous materials (hazardous material characteristic information used to ascertain R and S Phrases can be obtained from MSDSs or similar documents).

C5.3.7.1.3 Containers of irritants *(reizend),* highly flammable materials *(leicht brennbar),* and oxidizers *(brandfördernd)* with a maximum volume of 125 ml do not require R and S phrases on the label. The same applies to harmful materials *(gesundheitsschädliche,* see Table C5.T3, Hazard Property No. 8) with a maximum volume of 125 ml, provided the access to these products is controlled and they are not made available for general use or retail.

C5.3.7.1.4 The size of the hazardous material label should meet the following size requirements:

Container/Package Volume (liters)	Recommended Label Size (mm)
< 3	52 x 74
3–50	74 x 105
50–500	105 x 148
> 500	148 x 210

The hazard symbol must measure at least one tenth of the entire label and have an area of at least 1 cm^2. The information required may be printed directly on the package or container. See Table C5.T3.

C5.3.7.1.5 The packaging of cadmium-containing preparations (alloys) used for welding and soldering must be labeled with the following:

"Attention! Contains cadmium. Dangerous vapors could occur during application. Follow manufacturer instructions. Comply with safety requirements." *(Achtung! Enthält Cadmium. Bei der Anwendung entstehen gefährliche Dämpfe. Anweisung des Herstellers beachten. Sicherheitsanweisungen einhalten.)*

C5.3.7.1.6 Packaging of preparations available from retailers containing more than 1 percent by volume of active chlorine must be labeled with the following:

"Attention! Do not mix with other products, dangerous gases (Chlorine) may be released." *(Vorsicht! Nicht zusammen mit anderen Produkten verwenden, da gefährliche Gase (Chlor) freigesetzt werden können.)*

C5.3.7.1.7 Additional labeling requirements for other preparations, such as lead-based paint, preparations in aerosol spray cans, pesticides, decontaminated PCB-containing devices, PCB/PCT-containing equipment, and asbestos-containing products are addressed in Chapters 2 (Air Emissions), 11 (Pesticides), 14 (Polychlorinated Biphenyls), 15 (Asbestos and Artificial Mineral Fibers), and 17 (Lead-Based Paint).

C5.3.7.2 Labeling Requirements for Transportation Units, Tank Vehicles, Containers, Tanks, or Packaging

C5.3.7.2.1 Vehicles used for transporting hazardous materials must be labeled in accordance with the ADR.

C5.3.7.3 Labeling Requirements for Areas that Store and/or Handle Hazardous Materials

C5.3.7.3.1 Mandatory signs *(Gebotszeichen)* and hazard signs *(Warnzeichen)* must be placed at workplaces where hazardous materials are handled and/or stored. See Appendices C5.A4 and C5.A5.

C5.3.7.3.2 Areas that store and/or handle compressed gas cylinders containing very toxic or flammable gases must be equipped with special protection areas *(Schutzbereiche).* Special protection areas must be labeled according to the hazard associated with the respective type of gas (i.e., danger of explosion or danger of poisoning). Any associated piping must also be clearly labeled to indicate the type of gas it contains and connection points *(Anschlußstellen)* and extraction points *(Entnahmestellen)* must also be clearly labeled.

C5.3.7.3.3 Smoking is prohibited in areas where flammable materials are stored and/or handled. These areas must be labeled with “No smoking” signs.

C5.3.7.4 Additional Requirements for **Baden-Württemberg**, **Bayern**, **Hessen**, and **Rheinland-Pfalz**.

The following requirements regarding the labeling of facilities that store, distribute, and/or handle water endangering substances must be complied with, as applicable, in **Baden-Württemberg** (BW), **Bayern** (Bay), **Hessen** (Hes), and **Rheinland-Pfalz** (Rh-PF).

Additional Requirement	BW	Bav	*Hes*	*Rh-PF*
Facilities must maintain clearly visible operating instructions (*Betriebsanweisung*).	X	X[1]	*X*[2]	*X*[3]

Additional Requirement	BW	Bav	*Hes*	*Rh-PF*
Operators of facilities must affix clearly legible, permanent labels indicating the hazardous substances that are used and the pressure of the containers, if applicable.	X	X[1]	*X*	--
Operators of facilities must permanently affix the officially published Operating Procedures *(Merkblatt)* "Instructions for the Use and Safe Handling of Water Endangering Substances" *(Betriebs- und Verhaltenvorschriften beim Umgang mit wassergefährdenden Stoffen)* in conspicuous places in the vicinity of facilities (see Appendix C5.A8) and must inform facility personnel of the contents.	*X*	*X*	*X*	*X*
Fittings must be labeled so that they cannot be used incorrectly. Above-ground piping and underground piping in manholes must be marked with appropriate colors, so they can be easily recognized.	--	--	*X*	--

Notes:

1. Facilities classified as Water Hazard Category *A (Gefährdungsstufe A)* are exempt from this requirement (see Table C5.T2).
2. Facilities that store, distribute, or handle heating oil are exempt from this requirement.
3. Facilities classified as Water Hazard Category A *(Gefährdungsstufe A)* are exempt from this requirement (see Table C5.T2). Facilities that supply residential buildings or similarly used buildings with heating oil are also exempt, but must affix the operating procedures *(Merkblatt).*
4. No official operating procedures *(Merkblatt)* have been published for BW.

C5.3.8 Hazardous Material Minimization

DoD installations shall evaluate minimization options for all hazardous materials in use. The results must be documented in writing. The evaluation process must include the following elements:

- substitution of hazardous materials with less hazardous alternatives; and
- process modifications to reduce the volume of hazardous materials used and employee exposure.

C5.3.9 Hazardous Material Processed Through the Defense Reutilization and Marketing Service (DRMS)

All excess hazardous material will be processed through the Defense Reutilization and Marketing Service (DRMS) in accordance with the procedures in DoD 4160.21-M. DRMS will only donate, transfer, or sell hazardous material to environmentally responsible parties. This subsection is not intended to prohibit the transfer of usable HM between DoD activities participating in a regional or local pharmacy or exchange program.

C5.3.10 Instruction and Training of Personnel

C5.3.10.1 All personnel who use, handle, or store hazardous materials must be trained in accordance with DoDI 6050.1 and other component instructions. The training should address the content of work- and substance-related operating instructions *(Betriebsanweisung)* that are displayed where hazardous materials are stored and/or handled (see C5.3.6.1).

C5.3.10.2 Annual verbal instruction *(Unterweisung)* based on the operating instructions must be provided to employees. The training should make specific reference to the place of work and include, but not be limited to the following topics:

- decontamination procedures;
- emergency response plan and procedures;
- spill containment;
- operating instruction *(Betriebsanweisung)* location and use;
- MSDS location and use;
- location and availability of hazardous materials inventory;
- labeling requirements; and
- any additional applicable FGS requirements.

C5.3.10.3 The date and content of the verbal instruction must be recorded and confirmed by employees through their signature. Training records must be maintained for at least 2 years.

C5.3.10.4 Verbal instruction must be provided to employees prior to assignments that may involve working with hazardous materials.

C5.3.10.5 Additional requirements for **Baden-Württemberg**, **Bayern**, **Hessen** and **Rheinland-Pfalz**.

The officially published leaflet on “Instructions for the Use and Safe Handling of Water Endangering Substances” *(Betriebs- und Verhaltensvorschriften beim Umgang mit wassergefährdenden Stoffen)* must be displayed in the vicinity of facilities that store, distribute, and/or handle hazardous substances (see Appendix C5.A8).

C5.3.11 Unauthorized Entry

The installation must prevent the unauthorized entry of persons or livestock into the hazardous materials storage area.

C5.3.12 Additional Restrictions for Specific Hazardous Material

C5.3.12.1 Table C5.T4 lists hazardous substances that are banned or otherwise restricted from use in Germany.

C5.3.12.2 Carcinogens and Mutagens

C5.3.12.2.1 Facilities must notify local German authorities through the Installation Commander when carcinogens or mutagens are used. Notification is required at least 14 days in advance of the first use of carcinogens or mutagens as well as prior to the start of new activities involving carcinogens or mutagens. The notification must include the following:

- name and volume of the substance;
- description of usage;
- protective measures;
- results of considerations concerning potential substitution of the substance and minimization of exposure;
- number of employees exposed; and
- level of potential exposure.

C5.3.12.2.2 Options for less hazardous substitutes for all applications must be evaluated and documented in writing. In the event that substitution is not possible, enclosed facilities must be utilized as much as possible, and concentrations in the ambient air must be minimized.

C5.3.12.2.3 Storage of carcinogens or mutagens must follow the storage requirements for toxic materials (see C5.3.17.2.2).

C5.3.12.3 Aliphatic Chlorinated Hydrocarbons

C5.3.12.3.1 The use of tetrachloromethane (CAS No. 56-23-5) and trichloroethane (CAS No. 25323-89-1) as solvents or cleaning agents is prohibited.

C5.3.12.3.2 The use of tetrachloroethene (CAS No. 127-18-4), trichloroethene (CAS No. 79-01-6), and dichloromethane (methylene chloride) (CAS No. 75-09-02) as cleaning agents is only permitted in enclosed systems.

C5.3.12.3.3 The application of 1,1,2,2-tetrachloroethane (CAS No. 79-34-5), 1,1,1,2-tetrachloroethane (CAS No. 630-20-6), pentachloroethane (CAS No. 76-01-

07), and trichloromethane (CAS No. 67-66-3) is only permitted in enclosed systems.

C5.3.12.4 Fertilizers

C5.3.12.4.1 Storage areas for fertilizers must comply with the requirements for water endangering substances.

C5.3.12.5 Specifically Regulated Substances Addressed in Other Chapters

Refer to chapters 2, 11, 14, 15 and 17 for additional requirements regarding ozone depleting substances (ODSs), pesticides, PCB/Ts, asbestos, and lead-based paint, respectively.

C5.3.13 Packaging of Hazardous Materials

C5.3.13.1 **Properties of Packaging Used for the Storage of Hazardous Materials**

C5.3.13.1.1 Packaging must be designed and constructed so that the contents cannot accidentally be released.

C5.3.13.1.2 Packaging must be resistant to normal, operational, and handling strains.

C5.3.13.1.3 Packaging must be made of materials that are compatible with its content.

C5.3.13.1.4 Packaging may not be designed so that the content may be mistaken for foodstuff or use colors or designs that may be attractive to children.

C5.3.13.2 **Properties of Packaging and Receptacles Used for the Transportation of Dangerous Goods as Parcel and Bulk Goods**

C5.3.13.2.1 New and reused packaging must be manufactured such that spills are prevented. Packaging must be kept closed during transportation to prevent spills.

C5.3.13.2.2 Each packaging or container *(Verpackung or Container)* for transportation must have a UN-coded label which indicates that the packaging or container design type has been tested and approved by the appropriate national authority *(zugelassene Bauart)*.

C5.3.13.2.3 Packaging must be inspected to ensure it is free of corrosion, contamination, or other damage.

C5.3.13.2.4 Packaging must be compatible with the material stored; where necessary, it must be provided with a suitable inner coating or treatment.

C5.3.13.2.5 Packaging that shows signs of reduced strength shall not be used or shall be reconditioned to the original specifications.

C5.3.14 Requirements for Facilities that Store, Distribute, and Handle Hazardous Substances

C5.3.14.1 Operational Requirements

C5.3.14.1.1 General Requirements

C5.3.14.1.1.1 Facilities that store, distribute, and handle water endangering substances (WGK 1 to WGK 3) must be operated to prevent the contamination of water bodies or other detrimental effects.

C5.3.14.1.1.2 A construction approval or a test of suitability *(Bauartzulassung oder Eignungsfeststellung)* from the German authorities is required for facilities that store, distribute, and handle water endangering substances, unless they are classified as facilities of ordinary or conventional construction type *(Anlagen einfacher oder herkömmlicher Art)* (see Appendix C5.A7). This requirement does not apply if substances are only temporarily stored for shipment operations (typically 24 hours during work days), and the respective containers comply with the requirements for dangerous goods *(gefahrgutrechtlich).* These requirements also do not apply to daily-use quantities in use at the work area and substances stored in minor quantities *(Handgebrauch)* in laboratories.

C5.3.14.1.1.3 The necessity for secondary containment is dependant on the volume and the Water Hazard Class of the substances stored, distributed, or handled (see Table C5.T2).

C5.3.14.1.1.4 Additional requirements for Facilities that Store, Distribute, and Handle Hazardous Substances in **Bayern**, **Hessen***,* and **Rheinland-Pfalz.**

The requirements in Table C5.T7 regarding facilities that store, distribute, or handle water endangering substance must be complied with.

C5.3.14.1.2 Additional Requirements for Facilities that Store, Distribute, and Handle Hazardous Substances located in Water Protection Zones and Areas Prone to Flooding

C5.3.14.1.2.1 The following requirements apply to facilities that store, distribute, and handle water endangering substances in protected areas and areas prone to flooding.

C5.3.14.1.2.1.1 Facilities that store, distribute, and handle water endangering substances are not permitted in groundwater extraction well areas *(Fassungsbereich, zone I)* nor in Zone II protected areas *(engere Zone, zone II).* Exceptions may be permitted by the competent German authority for above-ground facilities.

C5.3.14.1.2.1.2 Water Hazard Category D above-ground facilities are not permitted in zone III protected areas *(weitere Zone, zone III)* (see Table C5.T2). Above-ground facilities classified as Water Hazard Categories A, B or C (see Table C5.T2) may only be operated, if they are provided with secondary containment or are double-walled and equipped with a leak detection system.

C5.3.14.1.2.1.3 Facilities that store, distribute, and handle hazardous substances may only be operated in areas subject to flooding if they are secured against floating and shifting. It must be ensured that water cannot enter vent pipes, filling ports or other inlets in the event of flooding, and the facility must be resistant to mechanical damage from flooding.

C5.3.14.1.2.2 **Baden-Württemberg**

Facilities exceeding the capacity limits of water endangering substances as outlined below are not permitted in water protection zone III areas:

Water Hazard Class (WGK)	Capacity limit (m^3)
1	No limit provided
2	Above 100
3	Above 10

C5.3.14.1.3 Additional Requirements for Facilities that Store, Distribute, and Handle Hazardous Substances that Handle Flammable Liquids of All Hazard Classes

C5.3.14.1.3.1 Flammable storage facilities must be operated in accordance with state of the art technology *(Stand der Technik).*

C5.3.14.1.3.2 Flammable liquid storage is prohibited in the following locations:

- passageways and thoroughfares;
- staircases;
- generally accessible hallways;
- roofs of residential buildings, hospitals, office buildings and similar buildings as well as in their roof-spaces; and
- public restaurants and residences.

C5.3.14.1.3.3 The operator of a facility that stores and handles flammable liquids must maintain the facility in an adequate operating condition and ensure that the condition of the facility is continuously monitored. A facility with any

faults or defects may not be operated if it endangers personnel or third parties. Repair measures must be performed immediately.

C5.3.14.1.3.4 Areas where an explosive atmosphere may be generated must be kept clear of any substances that may increase the risk or the spread of fires. Vehicles may only be operated in these areas if required for the operation of the storage area. Smoking is prohibited and a clearly visible and legible sign must be posted.

C5.3.14.1.4 Additional Requirements for Facilities that Store, Distribute, and Handle Water Endangering Substances that Handle Hazard Class A I, A II and B Flammable Liquids

C5.3.14.1.4.1 The storage of Hazard Class A I, A II or B flammable liquids is prohibited in the following locations if the stored quantities exceed volumes specified below:

Location	Container Type	Volume (liters)	
		A I	A II or B
Residences and rooms that are immediately adjacent to residences without fire-resistant walls	Fragile containers	1	5
	Other containers	1	5
Basements of residences	Fragile containers	1	5
	Other containers	20	20
Retail and storage areas of retail facilities occupying an area of:			
< 60 m²	Fragile containers	5	10
	Other containers	60	120
60 to 500 m²	Fragile containers	20	40
	Other containers	200	400
> 500 m²	Fragile containers	30	60
	Other containers	300	600

C5.3.14.1.4.2 Hazard Class A I, A II and B flammable liquids must be stored as follows:

- electrostatic charges that could lead to a dangerous discharge are prohibited;
- buildings, in which above-ground facilities storing, dispensing, or transferring flammable liquids requiring a permit are located, as well

as above-ground outdoor tanks, must be protected against fire hazards due to lightning;

- vapor-air mixtures occurring during filling operations must be vented without danger or the facility must be equipped with a gas equilibrium system; and
- dangerous flashovers are prohibited.

C5.3.14.1.4.3 All equipment operated in an explosive atmosphere must be explosion proof.

C5.3.14.2 Inspections

C5.3.14.2.1 The following inspection requirements apply to facilities that store, distribute, and handle water endangering substances:

C5.3.14.2.1.1 An inspection is required prior to the initial use of the facility and after significant modifications.

C5.3.14.2.1.2 An inspection is required for liquid-tightness of facilities used for the storage, distribution and handling of water endangering substances and the related safety equipment. The inspection must be performed by an expert *(Sachverständiger):*

- every 5 years after commissioning of the facility;
- after the re-commissioning or reopening of a facility that has been temporarily decommissioned for more than 1 year;
- if the competent German authority issues an inspection request due to a suspected threat to water bodies;
- after decommissioning of a facility.

C5.3.14.2.1.3 The integrity of facilities for the storage, distribution, or handling of water endangering substances and the functioning of its safety devices must be continuously checked *(Eigenüberwachung).*

C5.3.14.2.2 Following a completed tank test *(Prüfbericht),* tank operators receive a inspection protocol on the completed test from the certified contractor. This inspection protocol contains information on any deficiencies detected. Severe deficiencies must be corrected as soon as possible. The inspection protocol must be maintained at a location identified by the operator of the storage tank.

C5.3.14.2.3 Additional Requirements in **Baden-Württemberg**, **Bayern**, **Hessen**, and **Rheinland-Pfalz**

C5.3.14.2.3.1 The following specific facilities require inspections by an expert *(Sachverständigen)* based on C5.3.14.2.1.1 and C5.3.14.2.1.2:

- above-ground facilities including the piping of hazard category C and D, in protection zones of category B, C, and D (see C5.3.14.2.3.2);
- underground facilities, including underground devices or equipment; and
- above-ground facilities, including the piping, of hazard category A if required in the specification, i.e., the determination of suitability or construction approval.

C5.3.14.2.3.2 In **Baden Württemberg**, **Hessen,** and **Rheinland-Pfalz** above ground facilities, including the piping, of hazard category B must be inspected prior to the initial use or after significant modifications. Further inspections may be required based on the specification, i.e., the determination of suitability or construction approval.

C5.3.14.3 Retention Basins for Fire Fighting Water

C5.3.14.3.1 Water endangering substance storage areas must be provided with a retention basin for fire fighting water if:

- water is used as the primary fire fighting agent; and
- the storage area is not exclusively constructed of non-flammable construction material; and
- the following storage volumes are exceeded:
  - 100 tons of Water Hazard Class 1 (WGK 1) substances; or
  - 10 tons of Water Hazard Class 2 (WGK 2) substances; or
  - 1 ton of Water Hazard Class 3 (WGK 3) substances.

C5.3.14.3.2 The required volume of the retention basin is not specified and depends upon safety categories (K1 to K4), a classification based on the type of fire brigade (on-post or public fire brigade), fire extinguishing equipment,, and other emergency planning factors.

C5.3.14.4 Ordinary and Conventional Facilities

A storage facility can be classified as ordinary or conventional (see Definitions, C5.2) depending upon certain criteria. See Appendix C5.A7 to determine whether a facility storing water endangering substances meets the ordinary and conventional facility criteria.

C5.3.15 Above-Ground Storage Tanks

C5.3.15.1 Notification Requirements

C5.3.15.1.1 Operators of above-ground storage tanks and tank farms that store flammable liquids outdoors are required to provide a notification

(Anzeigepflicht) to the competent German authorities (see C5.3.15.2.1) if the total storage volume of a single tank and/or tank farm is within the range of 450 to 1,000 liters of Hazard Class A I substances or 3,000 to 5,000 liters of Hazard Class A II or B substances.

In the case of the combined storage of Hazard Class A I, A II and B flammable liquids, five liters of Hazard Class A II or B substances shall be considered equal to one liter of a Hazard Class A I substance for the purpose of calculating the total storage quantity. The resulting Hazard Class A I equivalent shall be added to the Hazard Class A I volumes. For flammable liquids in Hazard Class A I with an ignition temperature *(Zündtemperatur)* below 125 °C, the volume is reduced to one-fifth of the volume prescribed for Hazard Class A liquids.

The notification must be provided to the authorities prior to commissioning.

C5.3.15.1.2 Notification is not required if the total volume of the tank and/or tank farm is less than 450 liters of Hazard Class A 1 substances or 3,000 liters of Hazard Class A II or B substances.

C5.3.15.1.3 Additional Requirements in **Bayern**

Operators must submit a notification to the competent German authority if they plan to operate or significantly modify facilities storing water endangering substances. This requirement is met if notification is already submitted to the authorities in order to comply with other regulations.

C5.3.15.1.4 Additional Requirements in **Hessen**

Operators must submit a notification to the competent German authority if they plan to operate facilities storing water endangering substances. This requirement is met if notification is already submitted to the authorities in order to comply with other regulations.

C5.3.15.1.5 Additional Requirements in **Rheinland-Pfalz**

Operators must submit a notification to the competent German authority if they plan to operate, significantly modify, or decommission facilities storing water endangering substances.

C5.3.15.2 Permit Requirements

C5.3.15.2.1 Above-ground storage tanks and tank farms storing flammable liquids outdoors require a permit *(Erlaubnis)* from the competent German authorities (listed below), if the total storage volume of the tank or tank farm exceeds 1,000 liters of Hazard Class A I substances or 5,000 liters of Hazard Class A II or B substances. This requirement applies to the construction, installation,

and operation of these tanks. Substantial modifications to such a facility also require a permit. DoD facilities, which have been in operation prior to 29 March 1998 and notified to German authorities are exempt from permit requirements as long as they have not been substantially modified.

Competent Authorities Responsible for Tanks Storing Flammable Liquids or Water Endangering Substances

Operator	***Baden-Württemberg***	***Bayern***	***Hessen***	***Rheinland-Pfalz***
Civilians	*Gewerbe-aufsichtsamt*	*Gewerbeauf-sichtsamt*	*Staatliches Amt für Arbeitsschutz und Sicherheits-technik*	*Gewerbe-aufsichts-amt*
Military	Regional *Wehrbereichsverwaltung*			
Civilians and Military	None	*Kreis-verwaltung*	Local *Untere Wasserbehörde*	

C5.3.15.3 Operational Requirements

C5.3.15.3.1 General

C5.3.15.3.1.1 Operators of above-ground tanks or tank farms that store water endangering substances must supervise this operation and ensure that all required safety equipment is in proper condition. The permitted *(zulässig)* filling levels of the above-ground storage tanks and the volume of the associated safety equipment must be monitored.

C5.3.15.3.1.2 The following additional requirements apply to the filling of storage facilities:

C5.3.15.3.1.2.1 Storage tanks may only be filled using fixed connections and overfill protection devices. This does not apply for tanks with a capacity less than 1,000 liters, if filled with a self-closing filling device. This also does not apply to collection containers *(Sammelbehälter)* that are filled by smaller, portable containers as long as the filling height of the containers to be filled can be visually controlled so that the filling process may be stopped before overfilling (as an example, the filling of a waste oil container).

C5.3.15.3.1.2.2 Drip losses must be contained.

C5.3.15.3.2 Special Provisions for Facilities Handling Flammable Liquids

C5.3.15.3.2.1 The following additional operational provisions apply to the storage of flammable liquids in above-ground storage tanks:

C5.3.15.3.2.1.1 Hazard Class A I, A II or B flammable liquids shall not be stored with light heating oil in adjoining chambers of a multiple-chamber tank.

C5.3.15.3.2.1.2 In tanks and tank containers (i.e., a tank container is a container that may be used for storage and transportation and has a minimum volume of 450 liters), the fill level shall be visible at all times from the exterior of the tank. This may be achieved by means of level indicators, or in the case of above-ground tanks, this requirement is met if the tank walls are made of a transparent material.

C5.3.15.3.2.1.3 All tank specifications shall be clearly indicated on the tank.

C5.3.15.3.2.1.4 Pressure monitoring is required for tanks with an internal positive pressure exceeding 0.1 bar.

C5.3.15.3.2.2 Indoor storage areas containing storage tanks that require notification or a permit must be equipped with ventilation and lighting.

C5.3.15.3.3 Special Provisions for the Storage of Solid Substances in **Baden-Württemberg**, **Bayern**, **Hessen**, and **Rheinland-Pfalz**

C5.3.15.3.3.1 Above-ground storage tanks, drum storage, filling and trans-shipment facilities (LAU Anlage) that store solid, water endangering substances are considered to be ordinary or conventional and do not require a determination of suitability, if:

C5.3.15.3.3.1.1 The storage area has a certified liquid-tight floor, and the solid substances are stored out-doors in containers that are always kept closed and protected from weather and potential damages, or the facilities (LAU Anlagen) are within a building or covered; or

C5.3.15.3.3.1.2 Based on the stored volumes and Water Hazard Class, the facility (LAU Anlage) is not classified above Water Hazard Category A.

C5.3.15.3.3.2 If the facility (LAU-Anlage) is not considered ordinary or conventional, the requirements contained in C5.3.15.3.1 and C5.3.15.3.2 must be complied with.

C5.3.15.4 Inspections

C5.3.15.4.1 Above-ground storage tanks containing water endangering substances must meet the requirements for inspections outlined in C5.3.14.2. (Inspection requirements for facilities that store, distribute, and handle water endangering substances).

C5.3.15.4.2 Above-ground storage tanks containing flammable liquids in quantities that require either a notification or a permit must be inspected by an expert *(Sachverständiger)* (above-ground storage tanks located indoors that require either a notification or a permit are exempt from these requirements). Inspections must be conducted as follows:

- prior to commissioning;
- after significant modifications prior to re-commissioning;
- before re-commissioning a facility that has been temporarily decommissioned for more than 1 year;
- every 5 years (lightning protection and cathodic corrosion protection systems must be inspected every 3 years).

C5.3.16 Distribution Facilities (Filling and Trans-Shipment *[Abfüll- und Umschlagplätze])*

C5.3.16.1 Notification

C5.3.16.1.1 Filling facilities for Hazard Class A I, A II, or B flammable liquids located in closed rooms require notification *(Anzeigepflicht)* to the competent German authority prior to commissioning, if their dispensing rate is between 200 and 1,000 liters/hour.

C5.3.16.1.2 Filling facilities for Hazard Class A III flammable liquids are exempt from this requirement, unless they are located in the same room as filling facilities for Hazard Class A I, A II, or B flammable liquids.

C5.3.16.1.3 Additional Requirements for Facilities in **Bayern**, **Hessen**, and **Rheinland-Pfalz**

C5.3.16.1.3.1 Operators must submit a notification to the competent German authority if they plan to operate facilities filling or trans-shipping water endangering substances. The notification is not required if other regulations that require a notification are applicable.

C5.3.16.1.3.2 In **Bayern** and **Rheinland-Pfalz**, a notification is also required if significant modifications to such a facility are conducted.

C5.3.16.2 Permits

C5.3.16.2.1 The construction, installation, and operation of filling facilities for flammable liquids listed below require a permit *(Erlaubnis):*

C5.3.16.2.1.1 Filling facilities in enclosed rooms, with a dispensing rate exceeding 1,000 liters/hr of Hazard Class A I, A II, or B flammable liquids. Filling facilities for Hazard Class A III flammable liquids are exempt from this requirement unless they are located in the same room as filling facilities for Hazard Class A I, A II or B flammable liquids.

5.3.16.2.1.2 Outdoor filling facilities for Hazard Class A I, A II, or B flammable liquids. Filling facilities for Hazard Class A III flammable liquids are exempt from this requirement, unless they are connected with filling facilities for Hazard Class A I, A II, or B flammable liquids.

5.3.16.2.1.3 DoD facilities, which have been in operation prior to 29 March 1998, are exempt from permit requirements as long as they have not been substantially modified.

C5.3.16.2.2 Considerable modifications to such facilities also require a permit.

C5.3.16.3 Operational Requirements

C5.3.16.3.1 The use of flammable liquid dispensing devices must allow for the expedient and safe access and egress to and from the facility.

C5.3.16.3.2 The ground surface in the area of filling facilities must be sufficiently stable and impermeable.

C5.3.16.3.3 Filling and trans-shipment facilities (LAU Anlage) for water endangering substances may be considered ordinary or conventional if the requirements for these facilities are complied with.

C5.3.16.3.4 Additional Requirements for **Hessen** and **Rheinland-Pfalz**

C5.3.16.3.4.1 In **Hessen** and **Rheinland-Pfalz**, at onshore filling and trans-shipment facilities, all means of transport used for the filling or trans-shipment of water endangering substances shall be secured against rolling, shifting, or moving.

C5.3.16.3.4.2 In **Rheinland-Pfalz**, onshore filling and trans-shipment facilities must be equipped with secondary containment that is sufficient to contain the maximum volume of a substance to be potentially released before safety measures are activated to stop the release. The size of the secondary containment must be determined based on the maximum potentially spilled volume.

C5.3.16.4 Inspections

Onshore filling and trans-shipment facilities that store, distribute, and handle water endangering substances must meet the requirements for inspections outlined in C5.3.14.2 (Inspection requirements for facilities that store, distribute, and handle water endangering substances).

C5.3.17 Facilities Handling Hazardous Substances

C5.3.17.1 Handling facilities, which includes facilities that produce, treat, or use *(Anlagen zum Herstellen, Behandeln, Verwenden – HBV Anlagen)* hazardous substances, must comply with the requirements in C5.3.14.2. (Inspection requirements for facilities that store, distribute, and handle water endangering substances). If during the operation of these facilities, flammable liquids are stored in quantities exceeding the volumes required for the daily use (typically for one shift), they must adhere to the requirements in C5.3.16 (i.e., requirements for distribution facilities).

C5.3.17.2 Operational Requirements

C5.3.17.2.1 Cooling and Heating Units

In **Bayern** and **Hessen**, operators are required to prevent water endangering substances from infiltrating into the cooling water of cooling and heating units or ensure leaks are easily detected and contaminated cooling water cannot be released.

C5.3.17.2.2 Storage in the Workplace

C5.3.17.2.2.1 Daily-use quantities of hazardous substances may only be stored in work areas (typically for one shift).

C5.3.17.2.2.2 Flammable substances classified as A I, A II, or B, may only be stored in work areas if they are placed in appropriate safety cabinets (as an example, safety cabinets according to DIN 12925 part 1).

C5.3.17.2.2.3 Toxic and very toxic materials must be stored and secured so that only qualified persons *(fachkundige Person)* can access these materials.

C5.3.18 Drum and Container Storage Areas

C5.3.18.1 Notifications

C5.3.18.1.1 Operators of drum and container storage areas that store quantities within the ranges outlined below are required to provide a notification *(Anzeigepflicht)* to the competent German authority prior to commissioning.

Location	Container Type	Total Volume (Liters)	
		A I	A II or B
Interior Drum Storage Areas, Above-and Below-ground Level	Fragile containers	60-200	200-1,000
	Other containers	450-1,000	3,000-5,000
Above-ground Drum Storage Areas in Outside Areas	Fragile containers	-	25-100
	Other containers	450-1,000	3,000-5,000
Notes: If flammable liquids in Hazard Classes A II or B are stored together with flammable liquids in Hazard Class A I, then five liters of flammable liquids in Hazard Classes A II or B shall be considered equal to one liter of flammable liquid in Hazard Class A I for the purpose of calculating total storage quantity. The storage quantities of flammable liquids in Hazard Classes A II or B, calculated accordingly, shall be added to the storage quantities of flammable liquids in Hazard Class A I. For flammable liquids in Hazard Class A I with an ignition temperature *(Zündtemperatur)* below 125° C, the volume is reduced to one-fifth of the volume prescribed for Hazard Class A liquids.			

C5.3.18.1.2 Notification is not required for volumes below the minimum values of the range per hazard class, location, and type of container.

C5.3.18.1.3 In **Bayern**, **Hessen**, and **Rheinland-Pfalz**, drum and container storage areas that store water endangering substances must follow the same notification requirements as for above-ground storage tanks that store water endangering substances.

C5.3.18.2 Permits

C5.3.18.2.1 The construction, installation, operation, and modification of drum and container storage areas that store flammable liquids and exceed the quantities provided below, require a permit *(Erlaubnis)* from the competent German authority.

Location	Container Type	Total Volume (Liters)	
		A I	A II or B
Interior Drum Storage Areas, Above- and Below-ground Level	Fragile containers	200	1,000
	Other containers	1,000	5,000
Above-ground Drum Storage Areas in	Fragile containers	-	100

Location	Container Type	Total Volume (Liters)	
		A I	A II or B
Outside Areas	Other containers	1,000	5,000

Notes:

If flammable liquids in Hazard Classes A II or B are stored together with flammable liquids in Hazard Class A I, then five liters of flammable liquids in Hazard Classes A II or B shall be considered equal to one liter of flammable liquid in Hazard Class A I for the purpose of calculating total storage quantity. The storage quantities of flammable liquids in Hazard Classes A II or B, calculated accordingly, shall be added to the storage quantities of flammable liquids in Hazard Class A I. For flammable liquids in Hazard Class A I with an ignition temperature *(Zündtemperatur)* below 125° C, the volume is reduced to one-fifth of the volume prescribed for Hazard Class A liquids.

German Federal forces are exempt from the requirement to obtain a permit for facilities handling flammable liquids. Consequently, facilities operated by German Federal forces are permitted by the competent military authority *(Regionale Wehrbereichsverwaltung).* This also applies to Foreign military forces (refer to Chapter 1).

5.3.18.2.2 Drum and container storage areas for Hazard Class A III flammable liquids are exempt from this requirement, unless they are stored with Hazard Class A I, A II, or B flammable liquids and the volumes specified below are exceeded.

5.3.18.2.3 DoD facilities, which have been in operation prior to 29 March 1998, are exempt from permit requirements as long as they have not been substantially modified.

C5.3.18.3 Inspections

C5.3.18.3.1 Drum and container storage areas must meet the inspection requirements for facilities that store water endangering substances in above-ground storage tanks.

C5.3.18.3.2 Drum and container storage areas that contain flammable liquids that either require a permit or notification must meet the same inspection requirements as above-ground storage tanks (with the exception of required inspections every 5 years after commissioning).

C5.3.19 Piping

C5.3.19.1 Permits

All piping associated with a facility used for the storage, distribution or handling of hazardous substances, that does not extend beyond the site boundary, is subject to the same permitting and notification requirements required for the facility.

C5.3.19.2 Operational Requirements

C5.3.19.2.1 Underground piping is only permitted if an above-ground design is not possible (see Chapter 19, USTs).

C5.3.19.2.2 In **Bayern** and **Hessen**, the following requirements must also be complied with:

C5.3.19.2.2.1 Above-ground piping used to connect several facilities must have secondary containment, unless it is double-walled and equipped with a leak detection system.

C5.3.19.2.2.2 Flexible piping may only be installed above tight and resistant surfaces, except piping running above surface waters for operational reasons.

C5.3.19.3 Inspections

All piping associated with a facility storing, distributing, or handling hazardous substances that does not extend beyond the site boundary, is subject to the same inspection requirements as the associated facilities.

C5.3.20 Storage and Handling of Compressed Gas Cylinders

C5.3.20.1 Welding Gases

C5.3.20.1.1 Compressed gas cylinders for welding as part of single-cylinder or multi-cylinder welding facilities may not be stored in:

- stairways and halls of buildings;
- in, or in the immediate vicinity of, narrow yards and passages;
- near stairs in outdoor facilities or near emergency escape routes;
- garages;
- residential rooms and rooms open to the public;
- in the immediate vicinity of highly flammable substances;
- areas without sufficient ventilation (i.e., without at least one opening near the floor and ceiling of a room with a width of at least 100 cm^2); and
- rooms located below the surface level of the surrounding area (except compressed gas cylinders for oxygen). Up to 50 compressed gas cylinders of oxygen may be stored in such areas in the following cases:
  - in areas with forced ventilation, if the hourly air exchange rate exceeds twice the volume of the storage room;
  - in areas with natural ventilation if the ventilation openings have an area of at least 10 percent of the room area, the efficiency of the

ventilation is ensured and the floor of the area is not located at more than 1.5 m below the surface level of the surrounding area;

- in work areas, except in amounts required for the continuation of work.

C5.3.20.1.2 Dispensing and maintenance of compressed gas cylinders is not permitted in storage areas.

C5.3.20.1.3 Welding facilities and compressed gas cylinders shall not be exposed to heat (i.e., open flames and radiators). A minimum distance of 1.0 m shall be maintained from open flames. The distance to radiators must be at least 0.5 m.

C5.3.20.1.4 Compressed gas cylinders must be adequately secured to prevent falling.

C5.3.20.2 Compressed Gas Cylinders for Liquid Fuel

C5.3.20.2.1 Compressed gas cylinders for liquid fuel must be secured against mechanical damage and heat. Storage of compressed gas cylinders in stairways, halls, narrow passageways, and in their immediate vicinity, is only permitted on a temporary basis if this is required for the continuation of work.

C5.3.20.2.2 Liquid fuel cylinders connected to facilities must be stored at a sufficient distance from basement openings, pits *(Gruben)*, uncovered manholes, shafts, and other flammable materials. In partially segregated areas with an area of less than 2 m², the storage of liquid gas cylinders is not permitted if leaking gas cannot adequately be vented to the outside.

C5.3.21 Chlorine Facilities

C5.3.21.1 The following general requirements apply to chlorine facilities and storage areas for associated chemicals:

C5.3.21.1.1 Rooms used for the operation of chlorine facilities and for the storage of chemicals must be lockable and must not be designated for permanent occupancy. The rooms must be designed to allow for the easy removal of chemicals. Chlorine facilities for water treatment and storage of associated chemicals may be located in outside areas, if they are secured against unauthorized access and operation.

C5.3.21.1.2 Rooms used for the operation of chlorine facilities and for the storage of chemicals must be secured against unauthorized access.

C5.3.21.1.3 If sodium hypochlorite, sodium chlorite, solutions of these substances, or hydrochloric acid are stored indoors, the temperature in such rooms must not fall below 0°C.

C5.3.21.1.4 Rooms for the operation of chlorine facilities or storage areas for associated chemicals must have ventilation. In the case of electrolysis units, the ventilation opening must be located close to the ceiling.

C5.3.21.1.5 Signs must be displayed in chlorine facilities and associated storage rooms indicating hazards and appropriate precautionary measures.

C5.3.21.1.6 All parts of chlorine facilities must be resistant to operational, chemical, mechanical, and thermal strains to be expected during their lifetime.

C5.3.21.1.7 Containers used for the storage of chemicals associated with chlorination must be equipped with caps and covers that are secured against accidental opening. Caps and covers must be able to prevent the contamination of the contents with other substances and the accidental release of the contents during transport and handling. Containers must be kept closed.

C5.3.21.1.8 Chlorine gas cylinders must be secured against falling.

C5.3.21.1.9 Containers for chemicals or chlorine must be labeled according to their contents.

C5.3.21.2 The following special requirements apply to chlorine facilities operating with chlorine gas and associated storage areas:

C5.3.21.2.1 Rooms used for chlorine gas facilities may not contain any equipment other than that associated with the facility's operation and the associated chlorine gas cylinders. The rooms must not be connected to other rooms and must be separated from other rooms by fire-proof and gas-proof walls. The rooms must have a direct exit to an outdoor area. Doors must open outwards and be equipped with panic bars.

C5.3.21.2.2 Rooms used for chlorination facilities must be equipped with water sprinkler systems. The manual operation of the sprinkler system must be possible from outside the room. The room must have drains sufficient for the amount of water sprayed via the sprinkler system. Drains must be equipped with gas traps *(Geruchsverschlüsse)* and be visually inspected at least weekly.

C5.3.21.2.3 The floors of rooms for chlorine facilities must be level. The exit area may not be below the outside floor level and may not be higher than a loading ramp. For chlorine facilities used for the treatment of drinking water, underground storage rooms are permitted if they are equipped with chlorine gas detection systems.

C5.3.21.2.4 Hazardous releases of chlorine gas from chlorine facilities must be prevented (i.e., by limiting the size for any openings to the outside to 20 cm by 20 cm or by installing appropriate alarm systems). Accidental releases in emergencies

must not reach other rooms, manholes, pits, canals, or ventilation holes located below the facility level.

C5.3.21.2.5 Facilities equipped with suction pipes for chlorine gas are exempt from the above requirements.

C5.3.21.2.6 The temperature within the chlorine facility must not exceed 50°C.

C5.3.21.2.7 The chlorine gas dispensing system must be automatically interrupted if the raw water supply or the water flow is interrupted. This applies also for the dispensing systems using chlorine dioxide or chlorine solutions in chlorine electrolysis facilities.

C5.3.21.2.8 Chlorine facilities must have shut-off valves for connection pipes during the exchange of chlorine gas containers.

C5.3.21.3 The following additional requirements apply to the condition of chlorine facilities operating on chlorine dioxide and chlorine electrolysis facilities:

C5.3.21.3.1 Chlorine dioxide facilities must be operated to prevent the supply of pure sodium chlorite or acid from coming in contact with the raw water.

C5.3.21.3.2 Chlorine electrolysis facilities must be designed to prevent the release of hydrogen into rooms.

C5.3.21.4 The following requirements apply to the handling of sodium hypochlorite and sodium chlorite:

C5.3.21.4.1 Sodium hypochlorite may not come into contact with acids or chemicals that react similar to acids.

C5.3.21.4.2 Sodium hypochlorite and sodium chlorite may only be stored together with acids or chemicals that react similar to acids if either sodium hypochlorite or acidic substances are stored in unbreakable containers.

C5.3.21.4.3 Sodium chlorite may not come into contact with fats, oils, oxidizers, acids and strong salts if this is not required by the process technology.

C5.3.21.4.4 Sodium chlorite may not be stored near fats and highly flammable substances. Smoking is prohibited in areas where sodium chlorite or its solutions are handled.

C5.3.21.4.5 Sodium chlorite may not be contaminated with other substances.

C5.3.21.5 Inspections of Chlorine Facilities

C5.3.21.5.1 Chlorine facilities may only be commissioned or re-commissioned after an inspection by a qualified individual *(Sachkundiger).* Inspectors must have

obtained the knowledge to assess the technical condition of chlorine facilities through their qualifications and/or experience. The inspection shall put special focus on gas-conducting parts.

C5.3.21.5.2 During their operation, facilities must be regularly inspected by a qualified individual. Inspections must be performed at least on an annual basis.

C5.3.21.5.3 Tightness testing of flexible gas connection lines and connections, the sprinkler system and the chlorine gas detection system is required prior to commissioning of the facility, after significant modifications, and every 6 months. The type(s) and results of inspections must be recorded in an inspection log book.

C5.3.22 Dangerous Goods Advisor

C5.3.22.1 A Dangerous Goods Advisor must be appointed by each DoD installation that ships or transports dangerous goods and have a valid training certification, unless exempted. The Advisor does not have to be immediately involved in the shipment of dangerous goods.

C5.3.22.2 Appendix C5.A2 contains details regarding the duties of the Dangerous Goods Advisor. The primary responsibilities of the Dangerous Goods Advisor are:

- to monitor and train personnel;
- supervise compliance with regulations pertaining to the transport of dangerous goods;
- advise the DoD installation in its activities relating to the transport of dangerous goods;
- immediately report safety deficiencies to the responsible entity of the DoD installation; and
- prepare an annual report on the transport of dangerous goods,
- file a report if an accident during transport, loading, or unloading occurs, in which persons, animals, objects, or the environment have been damaged due to the release of dangerous goods.

C5.3.22.3 Only responsible individuals *(beauftragte Personen)* are allowed to execute the handling of dangerous goods, whereby they must work closely with the Dangerous Goods Advisor. A responsible individual must have detailed knowledge on the safe movement of dangerous good that he/she is handling. The responsible individuals must receive repetitive (i.e., annual) internal or external training. The training may be provided by the Dangerous Goods Advisor or external certified agencies.

C5.3.22.3.1 The responsible individuals *(beauftragte Person)* must be authorized to give instructions.

C5.3.22.3.2 All personnel that actually handle dangerous goods, for example at a unit level, must have been instructed by the responsible individuals how to load, unload, or handle the respective dangerous goods.

C5.3.23 Information to be Provided to the Authorities

C5.3.23.1 DoD installations that operate facilities requiring a permit must provide biennially, information concerning recycled waste types from the preceding 2 years.

C5.3.23.2 Upon request, the competent authorities should be provided with statistical data with respect to:

- accidents related to the handling of hazardous materials,
- facilities handling water endangering substances and which are subject to supervision by authorities, and
- accidents related to the transportation of hazardous materials.

C5.3.24 Protective Measures

C5.3.24.1 Employees performing hazardous work (which may include management of hazardous wastes, working alone, etc.) must be monitored. This may be done by ensuring that the person:

- keeps permanently in sight of other persons,
- is equipped with an electronic system as means of supervision, or
- is supervised by other persons at small intervals.

C5.3.24.2 Appropriate fire equipment and protection, including extinguishing media must be readily available. Available equipment must bear appropriate labels, should be easily accessible, and be easy to handle. Fire extinguishers should comply with DIN EN 3 or DIN 14406.

C5.3.24.3 Appropriate personal protective equipment must be available.

C5.3.24.4 Testing and maintenance of equipment must be performed at least on an annual basis. Fire extinguishers and ventilation systems must be inspected at least every two years.

C5.3.24.5 Any deterioration or malfunction of any facility that could present a safety issue must be corrected immediately.